THE VETERINARY RECORD

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"Our Veterinary Surgeon Register."

More than one struggling newspaper, connected with horses, has in times past hit upon the idea of offering its readers some gratuitous attraction other than the news and articles which are its legitimate work. Some had "Our Servants Register," others "Our Horse Register." Under these heads were lists of grooms and coachmen wanting jobs, or remarkable horses that anonymous editors could specially recommend. Very seldom did these attractions assist the benevolent paper to prolong a precarious existence beyond a few months. The reading public are not all asses, and the gratuitous "Register" is too much on a par with the teapot given away with a pound of tea to deceive any but the weakest intelligence.

A paper called *The Stable and Kennel* has lately started a Register of Veterinary Surgeons which might have been treated with silent contempt but for an editorial *exposé* in its issue of September 23rd. Says the Editor: "In order to complete our arrangements for enabling any reader of *The Stable and Kennel* to secure, almost anywhere in the United Kingdom, the services of a competent veterinary surgeon in case of need, we recently communicated with several hundred members of the profession—of whose qualifications we had taken pains to satisfy ourselves—inviting their co-operation. Incidentally we told them that we would be glad to receive items of news from them occasionally, from their respective localities."

We have received from practioners two or three of the circulars issued, and we challenge the veracious Editor to produce evidence of having "taken pains" to satisfy himself of the qualifications of the persons applied to. How can he estimate those qualifications? Does he consider himself better able to judge than the examining body of the Royal College of Veterinary Surgeons? Does he think it fair to his readers to make a selection of professional men upon the tittle-tattle of copers and stablemen, or does he think "competent" veterinary surgeons are those most likely to supply him with penny-a-line paragraphs for his classical pages?

In all over-crowded professions there are men willing to increase their earnings by any little extras, not positively dishonest—but they are seldom the most competent. In professional life there should be, and is among the best men—an *esprit de corps* that prevents the individual adopting methods injurious to the corporate body. We feel confident that no self-respecting practitioner would allow his name to be placed upon a Register compiled and kept by an anonymous layman. Such a list must be misleading and injurious to the persons trusting to it; it may be the cause of gross injustice to practitioners.

The worst feature in the business is the statement by the editor that of the "several hundred members" communicated with: "almost without exception our request for permission to enter the names of these gentlemen on our Register was agreed to." We decline to believe this assertion, and we ask those members who may have thoughtlessly acceded to the editorial impertinence to reconsider their position. To have one's name on the Register of Veterinary Surgeons in the office of *The Stable and Kennel* is almost sufficient evidence for its removal from the Register at Red Lion Square.

Mr. W. A. Edgar in righteous indignation wrote the editor declining all co-operation, and concluding his letter thus: "Personally I consider your circular a great reflection upon the honour of veterinary surgeons, and strongly resent it as such." These words will be echoed by every veterinarian who allows himself one minute for thought. The true spirit of the man in compiling this private list of selected veterinary surgeons is made quite evident by the treatment of Mr. Edgar's letter. He published it, and his comments contain the opinion that it "gives us reason to congratulate ourselves that his name does *not* appear on our Register of Veterinary Surgeons." All who know Mr. Edgar will smile at this, but they will also draw the inference that if every other district list has its Edgar omitted the residue must indeed be a competent lot.

There is just one important factor in this affair that leads us to believe that we may have given too much prominence to a petty annoyance. It is disgusting to think that any practitioners have allowed their names to be used by a newspaper for the purpose of odious comparison with their neighbours, but it is hopeful to know that the list will not be much used. Most owners of horses will prefer to have other guides for the selection of a professional man than the unknown editor of a struggling paper, and the "most competent" practitioners will certainly be, like Mr. Edgar, *not* on that register.

We wonder what barristers and solicitors would say if *The Echo* proposed to register their "competent" members! or what medical men would do if *The Vegetarian* offered to register "several hundred of the profession" as a select lot to whom "it is safe to go for professional advice."

The scheme of *The Stable and Kennel* is a piece of intolerable impudence, unredeemed by the fact that it is based only on ignorance, Of course an illicit register of the kind referred to cannot exist unless by the co-operation of veterinary practitioners. We trust all permissions given will now be withdrawn. The danger of a secret list is that many names may be added by an unscrupulous compiler, without the knowledge of their owners—only so could even an appearance of respectability be presented. We should be obliged by any authenticated accounts of this register or of the attempts to form it.

failures in the treatment in the past than has been the case in this so-called milk fever of cows. Nearly all the anatomical systems of the body have, by one investigator or another, been regarded as intimately associated with the cause of the disease. Thus the cerebro-spinal, ganglionic, gastro intestinal, circulatory, generative, and mammary systems have each in their turn received attention; while anæmia, congestion, embolism, fatty degeneration of vessels, and apoplexy (both from extravasation of blood and effusion of serum) are pathological conditions which different observers have stated to be present as explaining the nature of the malady. Others again have looked upon the disease as a sort of sapræmia, resulting from the absorption of toxins from the womb; and lastly it is regarded as an intoxication due to the entrance into the blood of something formed in the udder.

I think it must be conceded for most of these various views that some argument may be advanced in support thereof, but the number of them is plain proof that, with perhaps a single exception, they all fall short of giving us a pathology on which to formulate or found a rational treatment of the disease. So much was this the case that down to a comparatively recent period no medicinal treatment at all would compare very favourably with the results obtained by the most energetic therapeutist. Rarely do we see any disease in which the complications assume such protean and fatal characters, or one in which the apparent causes are so diverse as is observable in the case of milk fever of cows. And it is to these features I think we must to a great extent assign the multiplicity of views advanced from time to time to explain the phenomena and nature of the disease.

Milk fever occurs at all seasons of the year; naturally most cases being met with during the period of the greatest number of births. It is probable however that cases occurring in springtime and early summer are usually of a severer type than those occuring at other seasons, owing to the great quickening of the system which often takes place about this time, for it seems to be generally admitted that a quickly-acquired plethora is always a factor which favours the development of the disease.

Symptomatology—Premonitory Sympoms.

Under this heading we must include what is usually observed in many other diseases; there is nothing special in milk fever. Any departure from the normal occurring in a cow after a fairly easy delivery, in an otherwise susceptible subject, may herald an attack of milk fever. Thus a cow, usually full of milk at the time of calving, may be noticed to have less milk than one would expect, compared to her former calvings. In every other respect she appears to be normal. I have frequently observed such an animal to go down with an attack of milk fever in the course of a few hours. In some cows, again, constipation may be noticed, with slight straining and the passing of a small quantity of fæces. In such a case the rectum is usually loaded, the atonic condition of its walls not allowing of its expelling its contents. This may continne for a day and then the attack set in with great violence. In other cases, gnashing of the teeth, or a capricious appetite, and a wild look will alone be observed. Again, the hearing seems more acute than usual, and in a few cases the nose is dry and the breathing considerably quickened. Such may be regarded as premonitory symptoms.

The usual time for the manifestation of symptoms of milk fever is from eight to forty hours after parturition, the disease seldom occurring after the third day, though probably cases do occur as late as four or five weeks after calving, and perhaps later. Milk fever also occasionally occurs before calving, while the attack sometimes sets in during delivery, especially in very hot weather, and if from any cause delivery is delayed at such a time.

The symptoms of milk fever are so well known and have been described so often that it is unnecessary in a paper of this kind to enter into the question in great detail. Uneasiness, champing of the jaws, cramp, and a straightened condition of the hocks may all be noticed at times in the early stage. The pulse varies much in number, and the condition of the vessels will also vary. The breathing is sometimes fast, in other cases but little disturbed, slight roaring is often early noticed. The temperature is little disturbed, but usually showing a downward tendency. When it rises four degrees above the normal, lung mischief may be looked for, or some other complication. With staggering the general symptoms become more pronounced, the cow falls to rise perhaps one or more times, while severe clonic spasms give the neck a curved appearance. Often certain groups of muscles other than those of the neck may be noticed in a state of clonic spasm. The hollow viscera of the abdomen are also sometimes in a state of clonic spasm thereby inducing much uneasiness. The power to swallow is uncertain, and the tendency is for the symptoms to proceed until a state of complete coma is reached. The special senses one after another are lost, the jaw drops, the cow gets over on her side, and tympanitis is frequent. All the functions of organic life seem in abeyance with the exception of those of circulation and respiration. While in this condition the breathing is sometimes of that variety known as Cheyne-Stokes, and the pulse becomes irregularly intermittent and very feeble, aud death shortly closes the scene.

A train of symptoms similar to those indicated, and occurring in a cow, especially in connection with parturition, may be described as constituting a case of milk fever. With appropriate treatment however, arrest of symptoms may occur at any stage, and the cow recover her health almost as quickly as she lost it, undergoing apparently no convalescence. But while the symptoms of milk fever are unequivocal, their development may not occur in any regular sequence, depending largely in this matter, on that particular part of the cerebro-spinal nervous system, bearing the brunt of the attack, or in other words, suffering most from the action of the toxin. In this way we get three principal types of the disease, viz., the spasmodic, the comatose, and the paraplegic. The spasmodic form causes the animal much distress and intense pain apparently. It is said by many to be the most fatal form of the disease, and it certainly is the one in which accidents are most likely to occur, such as damage to the thighs, or the passage of ingesta up the œsophagus and thence to the lungs. It is in this condition that the early administration of chloral is of such great benefit. In the paraplegic form of milk fever the symptoms seem to begin behind (in the lumbar region) and to advance towards the higher nerve centres. The cow when first seen is quite unable to rise, or perhaps only a little rocky. In others respects she seems comfortable, the head subsequently becoming involved. In my experience this form is most likely to occur when the cow has been reduced previous to calving, with a view to prevent the occurrence of milk fever, or when she has been over-dosed with salts immediately before the attack sets in. I have seen some of these cases diagnosed, when seen early, as adynamia; treatment prescribed accordingly and a good prognosis given but with unfortunate results.

In all cases of milk fever, constipation is present, more or less as a consequence of derangement of the sympathetic system of nerves; the fæces in the rectum, especially where in contact with the bowel, are generally rather dry and also possess a peculiar odour; the dryness usually extends for about eighteen inches forwards and does not altogether appear to be due to the length of time the fæces have dwelt in the rectum, but rather that

absorption is more active from the rectum in milk fever than we find to be the case in many other diseases, while at the same time minute hæmorrhages take place from its mucous membrane with great facility. This is evidenced by the hand being frequently blood-stained, sometimes in a slight degree when removing the fæces. It seems to indicate a hæmorrhagic tendency in milk fever, and it is more than probable that changes similar to those occurring in the rectum, may be taking place elsewhere. Schmidt says "When one so often finds at the outset of post-partum paralysis excrement of normal consistence, and moistness, and in the last part of the bowel, two feet from the anus, only hard dry masses adherent to the mucous membrane, one is forced to the conclusion that these dry masses were, shortly before passing into the last part of the bowel, of normal consistence and moistness, and had become dry by their moisture having undergone absorption."

Retention of urine is often noted in milk fever, much depending, however, upon the degree of paralysis present, while the urine often contains sugar and albumen. (Aiken, Nocard, Gerrard). A peculiar condition of the urine is sometimes met with in the disease, it (the urine) becomes ropy, and is light yellow in colour and emits a strong odour. It is very prone to decomposition and froths much. It is probably connected with some change in the kidneys, and although I have seen recovery take place in milk fever with this condition of the urine, it undoubtedly adds to the gravity of the case. It occurs independently of catheterisation, and is probably the conditional which Violet in France, and Franck in Germany have described as *milk metastasis*. It was regarded at one time as a vicarious discharge of milk.

Condition of the Uterus.—Prolapse of the uterus sometimes occurs during the course of milk fever, but I have seen less of it of late years than formerly. Rapid expulsion of the membranes and speedy involution of the uterus was a sort of fetish with many writers on milk fever up to a comparatively recent date. It would appear probable, however, that if contraction was proceeding in a normal manner it would cease at once on the cause of the disease beginning to operate and the walls undergo relaxation as the disease advances, in conjunction with the other tissues of the body. If the membranes are not expelled before the attack sets in, expulsive power is lost and they will require removal. In such cases their removal is usually easy, and putrefaction will be very rarely present, or not marked, since when decomposition of the membrane has taken place the cow may be regarded as fairly safe from an attack of milk fever. When the membranes however are not expelled in a cow down with milk fever the cause of the disease would seem to have begun to operate very early after parturition. Walley saw over fifty cases of retention of the membranes in cows suffering from milk fever, and my own views and McConnell's agree with Walley in the matter. We conclude with Schmidt and Stockfleth that rapid contraction of the womb does not take place in milk fever, and can have nothing whatever to do with developing the symptoms of the disease.

Condition of the Mammary Gland.—In view of recent theories advanced to explain the nature of milk fever, attention to the condition of the milk gland is important. Is there any change in the milk gland during an attack of milk fever, especially in the early stage? I think so. Many writers allude to the gland feeling hard, while all agree as to diminished secretion. The milk is apparently normal, if we except a slight tinge of blood sometimes witnessed. Mammitis is constantly absent in the early stage (if we except a few mild cases of tubercular mammitis) occurring only as a complication. Any erythema present in the skin of the udder disappears before the onset of the attack.

I am of opinion that a change of some kind or other does take place in the mammary gland in milk fever, and that early in the attack. It is not inflammatory, and is of an ephermeral character and apparently involves only the gland tissue of the organ. What is its nature? A neurosis, an urticaria. That urticaria or an allied condition may attack other organs than the skin is admitted by clinicians. Sir Andrew Clarke recognised the existence of urticarial asthma, a condition known likewise to occur in bovines in association with a similar condition affecting the skin. It would be quite possible, indeed highly probable, for some transient change of the nature indicated to take place in the udder in milk fever, and with but slight external manifestations, even if not entirely limited to subjective sensations appreciable only to the cow. It is desirable that observations may be made especially relating to the udder, so that we may obtain more correct information as to the changes which do actually take place in the gland in milk fever and the period immediately antecedent to the development of the disease, or those symptoms which point to its existence.

Duration.—An attack of milk fever may be arrested at any stage with appropriate treatment, and in the absence of complications, on the other hand neglect of certain measures may result in a moderately severe case being quickly fatal. It may be said that the duration of an attack of milk fever will depend largely on the promptness with which treatment is commenced. Many cases may now be regarded as cut short or aborted. In very few instances among animals has the duration and course of a disease been so favourably influenced by treatment as has been the case with milk fever in recent years. When, however, the symptoms have become pronounced the disease lasts from one to three days, occasionally running a longer course; while in cases in which recovery has been prompt a relapse sometimes occurs.

Complications and Sequelæ.

These are numerous and most important. I think we have seen more reason to think so of late years than was formerly the case, when the great majority of animals died, or were slaughtered in the comatose stage of the disease. By far the most important complications are those affecting the lungs. Pulmonary mischief in milk fever may originate in three ways: (*a*) From the regurgitation of food, or ingesta, from the stomach along the gullet, and passing into the larynx and thence to the lungs, inducing broncho-pneumonia, or resulting at once in suffocation. (*b*) From the passing of fluids into the trachea from the mouth, either saliva or medicines administered *per orem* for the relief of the disease, constituting the so-called "drenching pneumonia." (*c*) Pulmonary congestion may set in very early in the attack irrespective of either of the above accidents.

Exposure to cold and wet at about the time of the onset of the attack would seem to favour the development of pulmonary congestion. In such instances the period of coma is usually short, and rarely severe, and I have frequently noticed that very soon after the lungs become involved in a case of milk fever the head symptoms become ameliorated. Probably in all severe cases of milk fever there is a tendency to lung congestion, especially in association with cardiac failure. Not always does the lung trouble manifest itself during the course of the attack. The cow may appear convalescent and then in a day or two broncho-pneumonia may be noted. In such cases usually some foreign matter has passed into the bronchial tubes, or there has been a latent pulmonary tuberculosis.

In cases where the brain has been damaged during the attack consciousness is only partially regained, the animal remains dull and dies off in two or three days.

Loss of power in one or both hind limbs is common after milk fever, the left leg being oftener affected than

the right; recovery usually follows after a time when only one leg is involved, but should both be affected the result is usually bad. Inability to stand, from degenerative changes in the lumbar region of the cord, is sometimes noticed, and involves slaughter, the paralysis being permanent. Gangrene ot a limb is occasionally seen, I have met with three instances; while in two cases gangrene of the udder has been noted to follow milk fever. Inability to stand on the front legs lasting for several days we have seen, recovery usually following. Other occurrences such as amaurosis, dysphagia, nephritis, mammitis, etc., have been occasionally seen to follow an attack of milk fever, indeed it could not be expected but that a disease producing such a profound impression on every part of the system, and running its course so rapidly, would entail damage, and that frequently, on some part or other of the body.

Prognosis.

The prognosis in milk fever was a very sorry affair with most practitioners down to a comparatively recent period. Thus Goring gave the deaths 40.8 per cent. in 721 cases; Saint Cyr (466 cases) 45 per cent.; Stockfleth 50 per cent.; Bavarian veterinary surgeons 48 per cent.; Eberhart 50 per cent. and Bruin 66 per cent. Similar statistics would apply to this country down to the last ten or twelve years, In my own practice I have had of late years a mortality of twenty per cent. from all causes.

The mode of onset in milk fever is not always an indication of the severity of the attack; cases which appear mild at first may die in a few hours, while others in great pain and very restless, make good and quick recoveries. This is less true, however, now than formerly, since the prognosis is not now nearly so uncertain. Much will depend on the stage of the disease, or the degree of poisoning present, when the practitioner is called in, and also on what has been hitherto done by the owner. There are no certain indications as to whether any particular case will recover or otherwise, and it may safely be said that milk fever is a disease which affords many surprises. This uncertainty and the generally large fatality attending the disease accounts for the frequency with which the butcher is, or has been in the past, called in and the animal slaughtered, since the affected cows are usually in good condition, and the flesh has not been proved to be harmful.

There are few symptoms an affected animal may not show and recovery yet take place. One of the earliest indications of a favourable issue is a rise in the surface temperature. A fairly regular pulse and steady breathing, along with spontaneous evacuation of the bladder and a free action of the kidneys are all favourable signs. Notwithstanding the return of consciousness and the presence of other favourable symptoms, we have noted that if the bowels do not act, or only slightly so, and the kidneys send down scanty and thick urine, there is great probability of a relapse to the comatose state, or that some profound local lesion has occurred in the lumbar region or in the thighs. Much blood in the rectum is also of grave significance.

In favourable cases also the udder will resume its secreting function, if perhaps we exclude those cases where local injections of iodide of potassium have been used in the course of the treatment of the disease. In these cases the functions of the gland may be suppressed for some days, though we have not seen this to the extent mentioned by some writers.

In conclusion, it may be said that the prognosis of milk fever is now fairly good if treatment is begun early, though there is still room for much improvement in this respect, but we must remain very sceptical as to the deaths ever getting much under ten per cent.

Etiology.

Essential and Predisposing Causes. In the whole of the mammalia the cow is the only animal which for many generations art has endeavoured to turn into a milking machine, and this milk producing power is still further specialised in those cows with what I might call a milk fever diathesis. Milk fever is also a disease which for practical purposes may be said to occur only in the cow, and it is generally true, that whenever a disease is confined to any particular species or class of animal that we shall find that there is some anatomical condition, or some special development of some normal physiological process in the organism, to account for the occurrence of that particular disease in that particular animal. Is this so in the disease under discussion? We think so. The very intimate connection existing between a specially developed mammary apparatus, and the disease usually known as milk fever is very suggestive of their standing in the relation to each other of cause and effect. We therefore would say that the essential causes of milk fever, as we usually meet with it, are a high and rich milk-producing capacity, associated with the parturient state.

In addition to breed, age is an important element in the causation of milk fever, the time of greatest liability corresponding with the period of *prime* on the part of the cow. The disease is rarely noticed at the first calving, but occurs with greater frequency at the second birth, and still more so at the third when the cow can first be said to become really liable to the disease. The fifth period of lactation is probably the one of greatest danger, cows being at their best at from five to eight years of age. The periods of greatest activity of the mammary gland and those of greatest danger from milk fever may therefore be said to be identical.

Diet also plays a most important part in the causation of milk fever, inasmuch as, unless the cow has a liberal supply of nourishment, the maximum conditions are not obtained in the matter of milk production, and the latter duties would soon become subservient to those of breeding and therefore the predisposition of the cow to milk fever lost. It may also be mentioned that a quickly acquired plethora, in any otherwise susceptible subject, is a most potent factor in the etiology of milk fever, it being difficult under such conditions to maintain the balance of the organism. Previous attacks predispose to the disease, as also does long periods between the dates of parturition, especially if the cow has been dry a long time before calving. Insufficient exercise is also a predisposing cause of milk fever, as well as favouring the course of the disease when it occurs from other causes; the mortality being greater in cows kept close than in those allowed to roam.

Contributory and Exciting Causes. In addition to those causes, predisposing and essential, already enumerated, there are certain other events which of themselves frequently appear as sufficient to explain the advent of an attack of milk fever in any particular case, but which I think can only be regarded as contributory to the attack. These exciting causes may be regarded as constituting the usual disturbers of health, such as chill, indigestion and errors of diet, excitement, extremes of temperature, etc., and have already been alluded to when treating of the premonitory symptoms.

In reference to the causation of milk fever two other questions require discussion, viz., the effect of removing the calf from the company of the cow at once, or soon after birth, and the effect of hand milking the cow as a cause of the disease.

Removal of the Calf. If the calf is removed at once or very soon after its birth, the cow becomes excited or disturbed at the time of greatest danger from an attack of milk fever, while the benefit of the natural method of relieving the udder of its milk is lost to the cow.

"That the lower animals are capable of expressing strong natural affection is patent to all observers. Who has failed to witness the restlessness, loss of appetite, and unhappiness of many a cow deprived of her calf." (Williams).

To this T Campbell adds, the instinct to give suck and certainly the act of sucking must be regarded as a natural stimulus to secretion. Removal of the calf may, therefore, be said to be one of the causes favouring the occurrence of milk fever, and it also naturally involves the removal of the milk by hand.

The Effect of Milking. Some observers go so far as to say that the sudden emptying of the udder by the hand is the sole or principal cause of milk fever, and it cannot be doubted that so sudden and great a reduction in the volume of the organ as that which accompanies a clean milking must have a great influence for good or evil on the working of the gland. The process is an unnatural one, especially when carried out at a time when the cells of the mammary gland are new to their work, and who shall say that these cells, as well as the phagocytes themselves, do not require that they shall be gradually brought to assume new duties, and not be called upon at once to continue working under great and sudden changes of blood supply and of external pressure.

It may be frequently noticed after drawing off a good quantity of milk from a newly calved cow that very little more milk will be secreted that day; the gland would here seem to have received a shock, from which it would take some hours to recover itself and again become active, and it is during this period that we find the greatest danger to exist in regard to milk fever. It is only those cows in which the activity of the milk gland is expected to be greatest that hand milking obtains to any extent, while it is in these very cows more than any others that alterations in the physical conditions under which the cells are working will be most severely felt, on account of the greater amount of work usually performed by them, and although we cannot go so far as some, and say that cases do not occur when the calf is left with the mother for some days and hand milking avoided, we think that the number of cases met with will be reduced when the system is followed, and only small quantities of milk removed by the hand at intervals. Hand milking of the cow as usually followed is therefore another of the numerous causes sometimes met with as inducing, or precipitating, an attack of milk fever.

Since the above was written a farmer came for *something* for his cow. About eight or ten hours after calving he had drawn off at one time nearly four gallons of milk, and since then (over three days) he had not been able to get any at all. The cow did not appear to be suffering in any way except that there was no milk.

(*To be continued*).

EXTRACTS AND NOTES.

THE GROWTH OF SCIENCE IN THE CENTURY AND ITS LESSONS.

Delivered at the Annual Meeting of the British Association for the Advancement of Science, at Dover, on September 13th, 1899,

By Professor Sir Michael Foster.

(*Continued from p. 175.*)

If we pass from the problems of the living organism viewed as a machine to those presented by the varied features of the different creatures who have lived or who still live on the earth we at once call to mind that the middle years of the present century mark an epoch in biologic thought such as never came before, for it was then that Charles Darwin gave to the world the "Origin of Species." That work, however, with all the far-reaching effects which it has had, could have had little or no effect, or, rather, could not have come into existence, had not the earlier half of the century been in travail pre-preparing for its coming. For the germinal idea of Darwin appeals, as to witnesses, to the results of two lines of biologic investigation which were almost unknown to the men of the eighteenth century. To one of these lines I have already referred. Darwin, as we know, appealed to the geological record, and we also know how that record, imperfect as it was then, and imperfect as it must always remain, has since his time yielded the most striking proofs of at least one part of his general conception. In 1799 there was, as we have seen, no geological record at all. Of the other line I must say a few words.

To-day the merest beginner in biologic study, or even that exemplar of acquaintance without knowledge, the general reader, is aware that every living being, even man himself, begins its independent existence as a tiny ball, of which we can, even acknowledging to the full the limits of the optical analysis at our command, assert with confidence that in structure, using that word in its ordinary sense, it is in all cases absolutely simple. It is equally well known that the features of form which supply the characters of a grown-up living being, all the many and varied features of even the most complex organism, are reached as the goal of a road, at times a long road, of successive changes; that the life of every being, from the ovum to its full estate, is a series of shifting scenes, which come and go, sometimes changing abruptly, sometimes melting the one into the other, like dissolving views, all so ordained that often the final shape with which the creature seems to begin, or is said to begin, its life in the world is the outcome of many shapes, clothed with which it in turn has lived many lives before its seeming birth.

All or nearly all the exact knowledge of the laboured way in which each living creature puts on its proper shape and structure is the heritage of the present century. Although the way in which the chick is moulded in the egg was not wholly unknown even to the ancients, and in later years had been told, first in the sixteenth century by Fabricius, then in the seventeenth century in a more clear and striking manner by the great Italian naturalist Malphigi, the teaching thus offered had been neglected or misinterpreted. At the close of the eighteenth century the dominant view was that in the making of a creature out of the egg there was no putting on of wholly new parts, no epigenesis. It was taught that the entire creature lay hidden in the egg, hidden by reason of the very transparency of its substance, lay ready-made but folded up, as it were, and that the process of development within the egg or within the womb was a mere unfolding, a simple evolution. Nor did men shrink from accepting the logical outcome of such a view—namely, that within the unborn creature lay itself in like manner, hidden and folded up, its offspring also, and within that again its offspring in turn, after the fashion of a cluster of ivory balls carved by Chinese hands, one within the other. This was no fantastic view put forward by an imaginative dreamer; it was seriously held by sober men, even by men like the illustrious Haller, in spite of their recognising that as the chick grew in the egg some changes of form took place. Though so early as the middle of the eighteenth century Friedrich Caspar Wolff and later others had strenuously opposed such a view it held its own, not only to the close of the century, but far on into the next. It was not until a quarter of the present century had been added to the past that von Baer made known the results of researches which once

and for all swept away the old view. He and others working after him made it clear that each individual puts on its final form and structure, not by an unfolding of pre-existing hidden features, but by the formation of new parts through the continued differentiation of a primitively simple material. It was also made clear that the successive changes which the embryo undergoes in its progress from the ovum to maturity are the expression of morphologic laws, that the progress is one from the general to the special, and that the shifting scenes of embryonic life are hints and tokens of lives lived by ancestors in times long past.

If we wish to measure how far off in biologic thought the end of the last century stands, not only from the end but even from the middle of this one, we may imagine Darwin striving to write the "Origin of Species" in 1799. We may fancy him being told by philosophers explaining how one group of living beings differed from another group because all its members and all their ancestors came into existence at one stroke when the first-born progenitor of the race, within which all the rest were folded up, stood forth as the result of a creative act. We may fancy him listening to a debate between the philospher who maintained that all the fossils strewn in the earth were the remains of animals or plants churned up in the turmoil of a violent universal flood, and dropped in their places as the waters went away, and him who argued that such were not really the "spoils of living creatures," but the products of some playful plastic power which out of the superabundance of its energy fashioned here and there the life-less earth into forms which imitated, but only imitated, those of living things. Could he amid such surroundings by any flight of genius have beat his way to the conception for which his name will ever be known?

Here I may well turn away from the past. It is not my purpose nor, as I have said, am I fitted, nor is this perhaps the place, to tell even in outline the tale of the work of science in the nineteenth century. I am content to have pointed out that the two great sciences of chemistry and geology took their birth, or at least began to stand alone, at the close of the last century, and have grown to be what we know them now within about 100 years, and that the study of living beings has within the same time been so transformed as to be to-day something wholly different from what it was in 1799; and, indeed, to say more would be to repeat almost the same story about other things. If our present knowledge of electricity is essentially the child of the nineteenth century, so also is our present knowledge of many other branches of physics. And those most ancient forms of exact knowledge, the knowledge of numbers and of the heavens, whose beginning is lost in the remote past, have, with all other kinds of natural knowledge, moved onward during the whole of the 100 years with a speed which is ever increasing. I have said, I trust, enough to justify the statement that in respect to natural knowledge a great gulf lies between 1799 and 1899. That gulf, moreover, is a twofold one: not only has natural knowledge been increased, but men have run to and fro spreading it as they go. Not only have the few driven far back round the full circle of natural knowledge the dark clouds of the unknown which wrap us all about, but also the many walk in the zone of light thus increasingly gained. If it be true that the few to-day are, in respect to natural knowledge, far removed from the few of those days, it is also true that nearly all of which the few alone knew then, and much which they did not know, has now become the common knowledge of the many. What, however, I may venture to insist upon here is that the difference in respect to natural knowledge, whatever be the case with other differences between then and now, is undoubtedly a difference which means progress. The span between the science of that time and the science of to-day is beyond all question a great stride onwards. We may say this, but we must say it without boasting. For the very story of the past which tells of the triumphs of science bids the man of science put away from him all thoughts of vainglory And that by many tokens.

Whoever, working at any scientific problem, has occasion to study the inquiries into the same problem made by some fellow-worker in the years long gone by, comes away from that study humbled by one or other of two different thoughts. On the one hand, he may find, when he has translated the language of the past into the phraseology of to-day, how near was his forerunner of old to the conception which he thought, with pride, was all his own, not only so true but so new. On the other hand, if the ideas of the investigator of old, viewed in the light of modern knowledge, are found to be so wide of the mark as to seem absurd, the smile which begins to play upon the lips of the modern is checked by the thought, Will the ideas which I am now putting forth, and which I think explain so clearly, so fully, the problem in hand, seem to some worker in the far future as wrong and as fantastic as do these of my forerunner to me? In either case his personal pride is checked. Further, there is written clearly on each page of the history of science, in characters which cannot be overlooked, the lesson that no scientific truth is born anew, coming by itself and of itself. Each new truth is always the offspring of something which has gone before, becoming in turn the parent of something coming after. In this aspect the man of science is unlike or seems to be unlike, the poet and the artist. The poet is born, not made; he rises up, no man knowing his beginnings; when he goes away, though men after him may sing his songs for centuries, he himself goes away wholly, having taken with him his mantle, for this he can give to none other. The man of science is not thus creative; he is created. His work, however great it be, is not wholly his own; it is in part the outcome of the work of men who have gone before. Again and again a conception which has made a name great has come not so much by the man's own effort as out of the fulness of time. Again and again we may read in the words of some man of old the outlines of an idea which in later days has shone forth as a great acknowledged truth. From the mouth of the man of old the idea dropped barren, fruitless; the world was not ready for it and heeded it not; the concomitant and abutting truths which could give it power to work were wanting. Coming back again in later days the same idea found the world awaiting it; things were in travail preparing for it, and someone, seizing the right moment to put it forth again, leapt into fame. It is not so much the men of science who make science as some spirit which, born of the truths already won, drives the man of science onward and uses him to win new truths in turn.

It is because each man of science is not his own master, but one of many obedient servants of an impulse which was at work long before him, and will work long after him, that in science there is no falling back. In respect to other things there may be times of darkness and times of light, there may be risings, decadences, and revivals. In science there is only progress. The path may not be always a straight line, there may be swerving to this side and to that, ideas may seem to return again and again to the same point of the intellectual compass; but it will always be found that they have reached a higher level—they have moved not in a circle, but in a spiral. Moreover, science is not fashioned as is a house, by putting brick to brick, that which is once put remaining as it was put to the end. The growth of science is that of a living being. As in the embryo phase follows phase, and each member of the body puts on in successession different appearances, though all the while the same member, so a scientific conception of one age seems to differ from that of a following age, though it is the

same one in the process of being made; and as the dim outlines of the early embryo become, as the being grows more distinct and sharp, like a picture on a screen brought more and more into focus, so the dim gropings and searchings of the men of science of old are by repeated approximations wrought into the clear and exact conclusions of later times.

The story of natural knowledge, of science, in the nineteenth century, as indeed in preceding centuries, is, I repeat, a story of continued progress. There is in it not so much as a hint of falling back, not even of standing still. What is gained by scientific inquiry is gained for ever; it may be added to, it may seem to be covered up, but it can never be taken away. Confident that the progress will go on we cannot help peering into the years to come and straining our eyes to foresee what science will become and what it will do as they roll on. While we do so the thought must come to us, Will all the increasing knowledge of nature avail only to change the ways of man—will it have no effect on man himself? The material good which mankind has gained and is gaining through the advance of science is so imposing as to be obvious to every one, and the praises of this aspect of science are to be found in the mouths of all. Beyond all doubt science has greatly lessened and has markedly narrowed hardship and suffering; beyond all doubt science has largely increased and has widely diffused ease and comfort. The appliances of science have, as it were, covered with a soft cushion the rough places of life, and that not for the rich only but also for the poor. So abundant and so prominent are the material benefits of science that in the eyes of many these seem to be the only benefits which she brings. She is often spoken of as if she were useful and nothing more, as if her work were only to administer to the material wants of man. Is this so? We may begin to doubt it when we reflect that the triumphs of science which bring these material advantages are in their very nature intellectual triumphs. The increasing benefits brought by science are the results of man's increasing mastery over Nature and that mastery is increasingly a mastery of mind; it is an increasing power to use the forces of what we call inanimate nature in place of the force of his own or other creatures' bodies; it is an increasing use of mind in place of muscle.

Is it to be thought that that which has brought the mind so greatly into play has had no effect on the mind itself? Is that part of the mind which works out scientific truths a mere slavish machine producing results it knows not how, having no part in the good which in its working it brings forth?

What are the qualities, the features of that scientific mind which has wrought, and is working, such great changes in man's relation to Nature? In seeking an answer to this question we have not to inquire into the attributes of genius. Though much of the progress of science seems to take on the form of a series of great steps, each made by some great man, the distinction in science between the great discoverer and the humble worker is one of degree only, not of kind. As I was urging just now, the greatness of many great names in science is often, in large part, the greatness of occasion, not of absolute power. The qualities which guide one man to a small truth silently taking its place among its fellows, as these go to make up progress, are at bottom the same as those by which another man is led to something of which the whole world rings. The features of the fruitful scientific mind are in the main three.

In the first place, above all other things, his nature must be one which vibrates in unison with that of which he is in search; the seeker after truth must himself be truthful—truthful with the truthfulness of Nature. For the truthfulness of Nature is not wholly the same as that which man sometimes calls truthfulness. It is far more imperious, far more exacting. Man, unscientific man, is often content with "the nearly" and "the almost." Nature never is. It is not her way to call the same two things which differ, though the difference may be measured by less than the thousandth of a milligramme or of a millimetre or by any other like standard of minuteness. And the man who, carrying the ways of the world into the domain of science, thinks that he may treat Nature's differences in any other way than she treats them herself, will find that she resents his conduct; if he in carlessness or in disdain overlooks the minute difference which she holds out to him as a signal to guide him in his search, the projecting tip, as it were, of some buried treasure, he is bound to go astray, and the more strenuously he struggles on the farther will find himself from his true goal.

In the second place, he must be alert of mind. Nature is ever making signs to us, she is ever whispering to us the beginning of her secrets: the scientific man must be ever on the watch, ready at once to lay hold of Nature's hint, however small, to listen to her whisper, however low.

In the third place, scientific inquiry, though it be preeminently an intellectual effort, has need of the moral quality of courage—not so much the courage which helps a man to face a sudden difficulty as the courage of steadfast endurance. Almost every inquiry, certainly every prolonged inquiry, sooner or later goes wrong. The path, at first so straight and clear, grows crooked and gets black; the hope and enthusiasm, or even the jaunty ease, with which the inquirer set out leave him and he falls into a slough of despond. That is the critical moment calling for courage. Struggling through the slough he will find on the other side the wicket-gate opening up the real path; losing heart he will turn back and add one more stone to the great cairn of the unaccomplished.

But, I hear someone say, these qualities are not the peculiar attributes of the man of science: they may be recognised as belonging to almost everyone who has commanded or deserved success whatever may have been his walk of life. That is so. That is exactly what I would desire to insist upon, that the men of science have no peculiar virtues, no special powers. They are ordinary men, their characters are common, even commonplace. Science, as Huxley said, is organised common sense, and men of science are common men, drilled in the ways of common sense. For their life has this feature. Though in themselves they are no stronger, no better than other men, they possess a strength which, as I just now urged, is not their own but is that of the science whose servants they are. Even in his apprenticeship, the scientific inquirer, while learning what has been done before his time, if he learns it aright so learns it that what is known may serve him not only as a vantage ground whence to push off into the unknown, but also a compass to guide him in his course. And when fitted for his work he enters on inquiry itself, what a zealous anxious guide, what a strict and, because strict, helpful schoolmistress does Nature make herself to him! Under her care every inquiry, whether it bring the inquirer to a happy issue or seem to end in nought, trains him for the next effort. She so orders her ways that each act of obedience to her makes the next act easier for him, and step by step she leads him on towards that perfect obedience which is complete mastery. Indeed, when we reflect on the potency of the discipline of scientific inquiry we cease to wonder at the progress of scientific knowledge. The results actually gained seem to fall so far short of what under such guidance might have been expected to have been gathered in that we are fain to conclude that science has called to follow her, for the most part, the poor in intellect and the wayward in spirit. Had she called to her service the many acute minds who have wasted their

strength struggling in vain to solve hopeless problems, or who have turned their energies to things other than the increase of knowledge ; had she called to her service the many just men who have walked straight without the need of a rod to guide them, how much greater than it has been would have been the progress of science and how many false teachings would the world have been spared ! To men of science themselves, when they consider their favoured lot, the achievements of the past should serve not as a boast, but as a reproach.

If there be any truth in what I have been urging, that the pursuit of scientific inquiry is itself a training of special potency, giving strength to the feeble and keeping in the path those who are inclined to stray, it is obvious that the material gains of science, great as they may be, do not make up all the good which science brings or may bring to man. We especially, perhaps, in these later days, through the rapid development of the physical sciences, are too apt to dwell on the material gains alone. As a child in its infancy looks upon its mother only as a giver of good things and does not learn till in after days how she was also showing her love by carefully training it in the way it should go, so we too, have thought too much of the gifts of science, overlooking her power to guide.

Man does not live by bread alone, and science brings him more than bread. It is a great thing to make two blades of grass grow where before one alone grew ; but it is no less great a thing to help a man to come to a just conclusion on the questions with which he has to deal. We may claim for science that while she is doing the one she may be so used as to do the other also. The dictum just quoted, that science is organised common sense, may be read as meaning that the common problems of life which common people have to solve are to be solved by the same methods by which the man of science solves his special problems. It follows that the training which does so much for him may be looked to as promising to do much for them. Such aid can come from science on two conditions only. In the first place, this her influence must be acknowledged ; she must be duly recognised as a teacher no less than as a hewer of wood and a drawer of water. And the pursuit of science must be followed not by the professional few only but, at least in such measure as will ensure the influence of example, by the many. But this latter point I need not urge before this great Association, whose chief object during more than half a century has been to bring within the fold of science all who would answer to the call. In the second place, it must be understood that the training to be looked for from science is the outcome not of the accumulation of scientific knowledge but of the practice of scientific inquiry. Man may have at his fingers' ends all the accomplished results and all the current opinions of any one or of all the branches of science and yet remain wholly unscientific in mind ; but no one can have carried out even the humblest research without the spirit of science in some measure resting upon him. And that spirit may in part be caught even without entering upon an actual investigation in search of a new truth. The learner may be led to old truths, even the oldest, in more ways than one. He may be brought abruptly to a truth in its finished form, coming straight to it like a thief climbing over the wall ; and the hurry and press of modern life tempt many to adopt this quicker way. Or he may be more slowly guided along the path by which the truth was reached by him who first laid hold of it. It is by this latter way of learning the truth, and by this alone, that the learner may hope to catch something at least of the spirit of the scientific inquirer.

This is not the place, nor have I the wish, to plunge into the turmoil of controversy ; but, if there be any truth in what I have been urging, then they are wrong who think that in the schooling of the young science can be used with profit only to train those for whom science will be the means of earning their bread. It may be that from the point of view of the pedagogic art the experience of generations has fashioned out the older studies of literature an instrument of discipline of unusual power, and that the teaching of science is as yet but a rough tool in unpractised hands. That, however, is not an adequate reason why scope should not be given for science to show the value which we claim for it as an intellectual training fitted for all sorts and conditions of men. Nor need the studies of humanity and literature fear her presence in the schools, for if her friends maintain that that teaching is one-sided, and therefore misleading, which deals with the doings of man only, and is silent about the works of nature, in the sight of which he and his doings shrink almost to nothing, she herself would be the first to admit that that teaching is equally wrong which deals only with the works of Nature and says nothing about the doings of man, who is, to us at least, Nature's centre.

Looking back in this last year of the eighteen hundreds, on the century which is drawing to its close, while we may see in the history of scientific inquiry much which, telling the man of science of his shortcomings and his weakness, bids him be humble, we also see much, perhaps more, which gives him hope. Hope is indeed one of the watchwords of science. In the latter-day writings of some who know not science much may be read which shows that the writer is losing or has lost hope in the future of mankind. There are not a few of these ; their repeated utterances make a sign of the times. Seeing in matters lying outside science few marks of progress and many tokens of decline or of decay, recognising in science its material benefits only, such men have thoughts of despair when they look forward to the times to come. But if there be any truth in what I have attempted to urge to-night, if the intellectual, if the moral influences of science are no less marked than her material benefits, if, moreover, that which she has done is but the earnest of that which she shall do, such men may pluck up courage and gather strength by laying hold of her garment. We men of science at least need not share their views or their fears. Our feet are set, not on the shifting sands of the opinions and of the fancies of the day, but on a solid foundation of verified truth, which by the labours of each succeeding age is made broader and more firm. To us the past is a thing to look back upon, not with regret, not as something which had been lost never to be regained, but with content, as something whose influence is with us still, helping us on our further way. With us, indeed, the past points not to itself but to the future ; the golden age is in front of us, not behind us ; that which we do know is a lamp whose brightest beams are shed into the unknown before us, showing us how much there is in front and lighting up the way to reach it. We are confident in the advance because, as each one of us feels that any step forward which he may make is not ordered by himself alone and is not the result of his own sole efforts in the present, but is, and that in large measure, the outcome of the labours of others in the past, so each one of us has the sure and certain hope that as the past has helped him so his efforts, be they great or be they small, will be help to those to come.

THE LIFE HISTORY OF THE FREE STAGE OF ANKYLOSTOMA DUODENALE.

By Major G. M. Giles, M.B., I.M.S.

The free stage worms were cultivated as follows :

1. Clean river sand, sterilised by heat, was placed in a shallow vessel and covered.

2. Over the surface of the sand was poured the fæces of a patient suffering from ankylostomiasis mixed with a

sufficiency of previously boiled water to make it flow freely and suffice to thoroughly wet the sand. It is obvious that the method employed rigidly excludes the possibility of the inclusion of nematode ova other than those contained in the fæces used.

3. In the course of a few days, the length of time varying with the air temperature, the embryos hatch out. Within ten or fourteen days they attain sexual maturity. The females are impregnated, and, though differing entirely in size and appearance from the parasitic stage, lay eggs which are identical in size and appearance with those of the parasite.

4. If a sufficiency of nourishment be provided in the shape of fæcal matter, these eggs hatch out and proceed to sexual maturity like their parent, and an indefinite number of generations can be obtained in this way. It is needless to remark that the fæcal matter used to nourish these subsequent generations should be obtained from a person known to be free from ankylostomiasis.

5. It is probable that embryos of any generation, if introduced into the human intestine, develop into the well-known parasites.

Major Giles demonstrated specimens illustrating the life-history of the worm. The specimens in question were prepared, in 1889-90, from cultivations made in the course of an investigation into the etiology of the diseases known in Assam as kala-azar and beri-beri, the report thereon being published in the latter year. Although his observations had not yet been repeated by other observers, he had repeatedly carried through new series of cultivations, and beyond the fact that in 1896 he succeeded for the first time in maintaining the free stage worms to sexual maturity in water, he had found no reason to modify the statements advanced in his original report. Since the date of his report, however, an almost absolutely parallel life-history had been worked out for rhabdonema intestinale. Although carefully looked out for, he did not come across the anguillula stercoralis, or early free stage of this worm while in Assam, but the two forms can be easily distinguished by the markedly shorter tail of the ankylostoma rhabditis in all its stages. —*Brit. Med. Journal.*

ON THE PREPARATION AND USE OF CALMETTE'S ANTIVENENE.*

By O. W. Andrews, M.B., D.P.H., Staff-Surgeon R.N.

Varieties of Poisonous Snakes.

Poisonous snakes are chiefly met with in warm countries. All tropical countries except the Pacific Islands contain poisonous snakes, and most of the temperate regions, with the exception of New Zealand, do also. Venomous snakes are divided into two principal classes :—

(i) *Colubrine*—for example, cobras (Asia), mocassins, and coral snakes (North and South America respectively). black snake, tiger snake, and deaf adder (Australia).

(ii) *Viperine*—for example, small viper (England), rattlesnake (North America) chain viper (Daboia), russelli (of India), and puff adder (of South Africa). Colubrine snakes have comparatively long maxillary bones, which are mobile, but to a less extent than the corresponding bones of viperine snakes, and ankylosed to the fore part of the maxillary bones are grooved fangs ; posterior to these teeth in some varieties there are smooth hooks without furrows. Viperine snakes have broad heads, very short and very mobile maxillary bones carrying fangs which are perforated by a complete canal, which alone would serve to distinguish a viperine from a colubrine snake. The poison apparatus consists of a gland homologous with the parotid salivary gland of other vertebrates ; it is situated on each side of the head behind the eye and in front of the tympanic bone, which is united by ligaments with the mastoid bones and mandibles ; the gland is so placed beneath the masseters and internal pterygoid muscles that when the fangs pierce the skin the contraction of these muscles eject the venom through a duct opening at the base of the poison fang.

Collection of the Venom.

The method employed at Lille to collect venom is as follows :

The snakes are kept in large iron-wire glass lined cages in a house warmed artificially, so that the temperature never falls below 27 C. (80.6 F.). When a snake is required, it is grasped with the right hand below the head with catch forceps about three feet long (resembling tongue forceps). It is next caught between the index finger and thumb of the left hand. The jaws are then forced apart by the thumb and forefinger holding the snake, taking care that the mouth of the snake is turned away from the operator and his assistant, lest some of the venom be injected into the eye, as it is readily absorbed by the conjunctiva, and even a very small amount suffices to set up severe ophthalmia. The fangs are next cleared by pushing back the sheath of mucous membrane which surrounds them, and the assistant holds a watch glass beneath the poison fang, whilst the person holding the snake encourages the ejection of the venom by pressure on the glands with his (free) right hand. When the secretion ceases to flow the assistant removes the watch glass, and inserts a glass funnel down the mouth of the snake, breaks a raw egg into it, and forces this through the funnel by means of a glass rod. The snakes appear to resent this artificial feeding, but it suffices to keep them alive and well. The collection of venom and feeding being completed, the snake is returned, and the process repeated in about a fortnight's time. In returning the snake the catch forceps are always employed in the same manner as when taking it out of its cage.

M. Calmette, as a rule, mixes the venom from all the snakes in his collection, which, when we were there, included amongst others the naja haje of Egypt (Cleopatra's asp) ; cerastes or horned viper, also of Egypt, and the pseudechis porphyriacus (black snake) of Australia, hoplocephalus curtus (tiger snake) from the same country bothrops lanceolatus (fer de lance) of Martinique, and crotalus durissus (rattlesnake) of North America.

Composition of Snake Venom.

Venom, which is always callected from a fasting snake, is a clear limpid fluid resumbling white of egg in consistence but of a light yellow colour ; it is acid in reaction, and has a specific gravity of 1050. The average yield is from 2 to 3 c.cm. according to the size of the snake. A good-sized cobra yields from 30 to 45 mg. of dried venom. The venom is dried at a temperature of 16 to 20° C. in a desiccator over calcium chloride, and when dried has the appearance of gum arabic. If thoroughly dried and kept in well-corked bottles it preserves its toxic properties indefinitely. The composition of venom has been investigated by Dr. C. J. Martin, who finds that it consists of coagulable and non-coagulable proteids, and that the coagulable proteids may be regarded as albumoses rather than as globulins, the albumoses being hetero-albumose, proto-albumose, and deutero-albumose.

Snake venom is not a simple poison but is composed of at least two distinct poisons, one of these, the one which has the power of producing hæmorrhagic extravasation and intra-vascular clotting is destroyed by heating a solution to 85° C. But there is another, or others, not destroyed by a temperature close to 100° C. If a solu-

* Much of the matter included in this paper is contained in an unpublished report furnished by me to the Director-General of the Medical Department of the Navy in a course of instruction given at the Pasteur Institute, Lille, by the Director of that Institute, Dr. A. Calmette. to delegates from the Navy, Army, and Indian Medical Services.

tion of venom be heated to a temperature of 102° C. for twenty minutes all toxicity is completely destroyed. Dr. C. J. Martin states that if the fluid be filtered after precipitation of the albumen by heat varying between 70° and 95° C., and the filtrate dialysed in a current of sterile distilled water, the venom thus freed from albumin and deprived of its salts still contains a substance in the dialyse which when dried rapidly *in vacuo* consists of a brown amorphous powder forty times more toxic than normal desiccated venom, and which, moreover, kills in a manner which shows all the classical symptoms of snake poisoning. The analogy existing between the toxic albumoses produced by bacilli and those produced by the epithelial cell of the venom glands of snakes has been shown by Dr. Sidney Martin. The experiments of M. Calmette and Deléarde show that the blood of animals immunised against abrine is antitoxic for the venom of serpents as well as against ricine and diphtherial toxins, so that the production of immunity against snake-bites is quite as feasible as against these vegetable toxins. M. Calmette has shown that the only reliable chemical reagents are solutions of hypochlorite of lime 1 in 60, freshly prepared, containing 80 per cent. of available chlorine, or else 1 per cent. solution of gold chloride. Both of these reagents injected into the tissues immediately around the wound are capable of destroying any venom with which they come in contact. *In vitro* potassium permanganate can exert the same power, but in contact with the tissues of the body this power is speedily lost, therefore permanganate is not of any practical value. It throws down a dark precipitate of albumin when mixed with a solution of venom. Permanganate mixed with venom solution which has been previously heated to 80° C. and freed from albumin by filtration still throws down a precipitate which when dried consists of a brownish powder. Ammonia, alcohol, chloroform, and mercury perchloride all precipitate the albuminous bodies from venom, but these precipitates are capable of being redissolved in water or in excess of the reagent, and are as toxic as pure venom.

Symptoms of Snake Poisoning.

These vary with the species of snake concerned, the local effects being slight in some cases and grave in others.

Cobra Bite.—The symptoms are swelling of the part with intense pain and redness. The swelling extends towards the body; there is intense congestion, and the patient becomes drowsy or faint, suffers from vertigo, great weakness of the legs, profuse salivation, and loss of speech, but still appears to be conscious. There is dimness of sight, an aspect of extreme anxiety, nausea, vomiting, feeble pulse, and laboured breathing. The patient lies on his back, the respiratory efforts grow feebler, then the breathing ceases. Convulsions due to asphyxia follow, and lastly the heart ceases to beat, respiration stopping before the heart. Until respiration ceases the pupils are somewhat contracted, but respond to light.

Rattlesnake Bite.—There is considerable pain and swelling at the seat of the wound, and the local injuries have to be reckoned with, even after the general symptoms have ceased to cause anxiety.

Indian Viperine Snakes.—Bloody discharges from the rectum and other orifices of the body are very noticeable symptoms and ecchymoses occur in various organs; albuminuria is observed during recovery, which is never the case with cobra poisoning. Another distinct feature is that the pupils are always dilated and insensible to light.

Treatment.

Ammonia.

Professor Halford's method consists in injecting 10 or 20 drops of the strongest ammonia, mixed with 20 drops of water into the jugular or median vein, a method which Dr. Lauder Brunton long ago pointed out was powerless to protect the victims of the very venomous snakes. Frank Buckland was a great believer in ammonia as a remedy for snake-bites, but Calmette discourages the use of either alcohol or ammonia, which he says only do harm.

Strychnine.

Dr. Mueller, in Australia, injected strychnine hypodermically in all cases of snake-bites until the physiological action of the drug was manifest. Dr. L. Ralston Huxtable, of Sydney, N.S.W., at the Intercolonial Medical Congress of Australia, Sydney, in September, 1892, gave statistics of 426 cases of snake-bites which showed in 113 cases treated by strychnine 15 deaths, and in 313 treated otherwise 13 deaths.

Preparation of Calmette's Serum.

M. Calmette, in February, 1894, gave an account of the treatment of snake-bites by means of the serum of an animal immunised against cobra venom, and also against that of a viper, and against that of the Australian tiger snake. Experiments were first conducted by producing immunity in rabbits by the injection of gradually increasing doses of venom, commencing with a dose well under the lethal; and, finally, injecting doses many times the lethal. The method of producing the serum is as follows: A solution is first made from the dried venom of three distinct species of snakes, viperine and colubrine (crotalus durissus, bothrops lanceolatus, and naja tripudians), 3 grams of dried venom, the estimated cost of which is £6 sterling, are dissolved in 300 c.cm. of distilled water, the solution is effected by frequent agitation in a flask during a period of twenty-four hours, the solution during the intervals being kept in a dark cupboard. After this it is placed in three flasks with flattened sides and heated for thirty minutes in a water bath, the temperature of which is kept at 72° C. by means of a Roux's regulator. Heating to 72° C. coagulates the albumin, which falls down as a flocculent white precipitate, which is removed by filtration through filter papers. In all experiments hereinafter mentioned solutions of mixed venom prepared in this way were employed, namely, 1 in 100 for injecting into all animals except guinea-pigs, for which 1 in 1,000 was used.

The horses employed for the production of antivenomous serum are strong, young, healthy cart horses kept in stables hygienically perfect. All horses employed must be proved to be free from glanders by giving a negative reaction with the mallein test. The neck is washed with carbolic lotion. Half a milligramme of venom (that is ½ c.cm. of 1 in 100 solution) is injected into the subcutaneous tissue just in front of the shoulder. An abscess follows in a few days; it is opened and dressed with antiseptic lotions. After fifteen days, if the abscess has healed, 1 mg. (that is, 1 c.cm. of solution) is injected, and at the end of another fortnight 2 mg. are injected. The dose is increased from time to time, so that after one year the horse can resist 0.5 gram (that is, 50 c.cm. of solution) when injected subcutaneously, a dose which would suffice to kill twenty-five horses not previously immunised. After sixteen months of this treatment the horse should be sufficiently immunised to yield a valuable serum, and after two or three years it is immunised to the extent of being able to resist a dose of 1 gram (100 c.cm. of solution). When this state is reached the serum is said to have the strength of 200,000 units according to Roux's notation, that is to say, that if a rabbit be injected with a dose of serum equal to 1-200,000 of its weight, it will resist a dose of venom capable of killing the same weight of rabbit in twelve hours; 1 c.cm. of antivenomous serum injected intravenously should protect a rabbit against a dose of venom calculated to kill a similar but unprotected animal in twenty minutes. Immunity produced by repeated injections of venom is comparatively evanescent, so that horses after they have been brought up to the maximum

degree of resistance must be injected every two or three months with 1 gram of dried venom (100 c.cm. of solution). When employing large doses of solution of venom for horses, a wide-mouthed bottle is used, having a rubber cork perforated for two tubes which are arranged as in a wash bottle, the short tube is connected with a Higginson's syringe, the longer one which reaches to the bottom of the bottle is connected with a rubber tube terminating in a metal cannula which is introduced into the subcutaneous tissue of the neck in the situation already described, the solution being injected by bringing the syringe into play.

The method of bleeding the horses is similar to that employed in obtaining antidiphtherial and other serums. The serum, after being allowed to separate in a dark cool room for twenty-four hours is syphoned off into 10 c.cm. bottles fitted with rubber corks and caps; sterilisation is effected by heating to 60° C. in a water bath for one hour on three successive days. This temperature is sufficient to destroy any micro-organisms which might possibly have gained access to the serum during collection, but is insufficient to interfere with its protective power.—*British Medical Journal.*

DINNER TO MR. CROWHURST, F.R.C.V.S.

The dinner mentioned last week as likely to be given to Mr. Crowhurst, Government Veterinary Surgeon, took place on Tuesday evening last at the Commercial Hotel, Stellenbosch. The chair was taken by Mr. Krige, ex-M.L.A., and on his right hand was Mr. Crowhurst, the guest of the evening, who was surrounded by about forty friends, including bankers, clergymen, professors, farmers, and merchants. After an excellent dinner provided in his usual good style by the proprietor, Mr. Liesching, the Chairman proposed the health of Her Majesty the Queen, which was received with enthusiasm and the singing of the National Anthem.

Mr. Krige then proposed the health of the guest of the evening, Mr. Crowhurst, of whose services he spoke in the highest terms. Continuing, he stated that Mr. Crowhurst had been in the Colony for seven years, five of which he had resided in Stellenbosch. He spoke of Mr. Crowhurst's enthusiasm for his profession, and of his willingness and promptness in responding to the call of the farmers whenever his services were required, even in slight cases of sickness. (Applause.) He was surprised that Mr. Crowhurst's services were now to be dispensed with, and this he considered a great loss to the village and the country, and he proposed that the petition praying the Government to reinstate him, and which was already largely signed, should be circulated throughout the district, as there were large numbers of stockowners who would sorely miss his valuable services, but who could not be present at the dinner owing to the condition of the roads.

After an excellently rendered and amusing song by Mr. Elliott, manager of the Standard Bank, Mr. Crowhurst rose, amidst loud and prolonged applause to reply. He reviewed his residence amongst them as one of pleasure, and he trusted of usefulness. He had always endeavoured to do his duty—(great applause)—and if he had failed, the consciousness of having tried his best would be ever with him. He regretted leaving the service of the Government, as it might necessitate his return to England, and that meant a separation from his many friends in the Cape, and from the country he had hoped to make his own. He referred most kindly to Mr. Hutcheon, and to his able co-operation. He spoke of the increase of good stock, and the intention of the Government to reduce the veterinary staff to a minimum; of the dependence the farmers had on the surgeon, and the loss they must sustain in having no professional man to consult. (Applause.)

Mr. Harrington-Kyle spoke of the irreparable loss the farmers and the community generally would sustain in the departure of Mr. Crowhurst. He had imported many valuable animals, but would not continue to do so if we were to be without expert veterinary service.

Other speeches were made by Mr. Percy Havers, Mr. J. Watson, Dr. McPherson, Professor MacKenzie, Prof. Morrison, Messrs. Peringuey, Meyer, Nicholson, Mason, Chapman, Van Wyk, and Postlewaite.

The unanimous opinion of the gathering was that an appeal in the interests of this district should be made to the Government to have Mr. Crowhurst retained in his present position.

After singing "Auld Lang Syne" and "God Save the Queen," the dinner broke up.—*Cape Times.*

THE MIGRATION OF BIRDS.

The annual departure of the swallows from our shores, coincidently with the meeting of the British Association to report and register the progress of science, may remind us how much has still to be learned even about common natural phenomena.

Imperfect though our knowledge still is, it is at any rate an advance upon the old belief that swallows passed the winter in a torpid state at the bottom of lakes or ponds—a belief shared even by Dr. Johnson, to whom is attributed the truly scientific dictum that "a number of them conglobulate together by flying round and round, and then all in a heap throwing themselves under water, and lie in the bed of a river." As late as the year 1837 *The Kendal Mercury* published an account of swallows emerging from Grasmere Lake "in the form of bell-shaped bubbles," from each of which a bird came forth, with the editorial comment that this well-authenticated fact was given "in the hope that it may prove an acceptable addition to the *data* on which naturalists base their hypotheses." Hibernation, however, has not proved to be a working hypothesis. If one swallow does not make a summer, still less does it make a winter; and the fact —of which there seems to be little doubt—that some individuals, young birds perhaps of late hatchings, or old ones incapacitated by sickness or infirmity, are left behind when their companions start, has proved totally inadequate to support the inferences drawn from it. White, of Selborne, indeed, seems to have thought that the appearances, verified by himself, of house martins early in November, or house swallows in an exceptionally warm March, could only be explained on the supposition that they were temporarily awakened from a condition of benumbed torpidity; and his conclusion is that "many individuals of these two species do never leave this island at all, but partake of the same benumbed state." But White was too accurate an observer not to realise that migration is the rule and these cases are the exception. He would be the first to acknowledge with later ornithologists that the exceptions are rarer than he himself supposed; for, accurate as was his observation, its area was limited. In almost the only allusion that he makes to the fable of swallows retiring under water his own observations suggest that it may have arisen from their habit of roosting in large flocks before departing, in such places as the osier beds upon the Thames eyots; while, as to their being often found in a torpid state in church towers or in the crannies of cliffs during the winter, he tells us that such stories always broke down under inquiry. Nowadays they need no refutation. But White was in advance of his time in the careful observation and disregard of hearsay evidence which keep his name green among naturalists of a more scientific age.

It may be that the opening up to civilisation of the African continent will mark the 20th century by greater advances in ornithology than the 19th has seen, particularly in regard to the phenomena of migration. We are more scientific, but on some points we know little more than Gilbert White knew 120 years ago. To what extent, for example, is variation in the supply of food the determining cause of the migrations which, so far from being, as was once thought, the exceptional characteristic of a few species, are more or less universal? That it has much to do with the phenomena all are agreed; and so thought White, noting that "the matter of food is a great regulator of the actions and proceedings of the brute creation." Climate, which in popular estimation stands first, is probably a less operative cause; for birds generally, as compared with other vertebrate animals, are but slightly affected by extremes of heat and cold, so long as their supply of food is not affected thereby. It is hunger more than cold that enfeebles the birds which remain with us in winter; and those who feed robins or sparrows during a hard frost observe in them no diminution of lively pugnacity or cheerful impudence. What influence, again, has breeding and the rearing of young, independently of the food question, upon migration? This problem, too had presented itself to White, when he wrote that there is but one motive that can be set in competition with food—viz., love. To what extent does supply of food, or climate, or mere habit influence the choice of the breeding-places to which birds return year by year with such unfailing regularity? We have by no meaus heard the last word of scientific observation upon these questions. Nor, again, has science yet explained what is perhaps more wonderful than all, how migratory birds find their way unerringly over such immense distances, across whole continents or a thousand miles of ocean. The faculty of sight, by which alone it is now recognised that "homing" pigeons are guided, cannot account for all such movements, particularly for those which take place by night. To explain it by "instinct" only evades the difficulty; while theories of magnetism, by which it is assumed that birds steer for the magnetic poles, or of experience, according to which the older and stronger birds, who know the way, lead the rest, are little more than guesses, which still leave unexplained the main question.—*Times*.

ARMY VETERINARY DEPARTMENT.

The Council of the Royal College of Veterinary Surgeons have, at the request of the Secretary of State for War, addressed to his lordship a memorial pointing out the absurd and undignified position in which the officers of the Army veterinary staff are placed owing to the action of the War Office in giving military titles to all grades of departmental officers but themselves. Lord Lansdowne, we understand, quite recognises the mischief that is bound to result unless the prayer of the veterinary profession is acceded to. The position taken up by the War Office in the matter is childlike in its simplicity, and there can be only one settlement unless the titles are withdrawn from the less combatant departments, a course which is now beyond the range of possibility. Of all departmental officers the veterinary surgeons are, as everyone knows, the most combatant. They have actually to ride, and do ride, if they do their duty properly, with their regiments in action. That the War Office should grant combatant titles to all other classes of officers discharging departmental duties and refuse the same concession to the veterinary staff is simply ridiculous. But the military authorities proper are well aware of the injustice of the first decision, and have so strongly urged for a removal of the existing grievances that we believe all will be made right immediately. At the same time it is difficult to understand how the Pall Mall officials, with all the facts before them, can have been so ill-advised as to have disturbed not only the officers of the veterinary staff, but those of all the mounted branches, which are in complete sympathy with them, when the exercise of a little ordinary forethought would have shown how impossible the position was which the War Office was creating for itself. —*Army and Navy Gazette.*

CORRESPONDENCE

MILK FEVER.

Dear sir,

I notice your editorial comment on the translated article in the issue of September 16th.

All indirect cases of death are not eliminated from the continental statistics there given. A total of 80 per cent. of cases were *cured* out of a total of 2,400 cases *treated* in the countries named.

On the Continent much unnecessary eloquence and ink have, in my opinion, been wasted in trying to explain away the 20 per cent. of fatalities, but this may reasonably be attributed to being carried away by excess of fervour in the flush of great success.

Apart altogether from this explaining away, the fact remains that (unless indeed we believe and accept the scriptural dictum that "all men—and especially Continental men—are liars") the 80 per cent. of cures must be accepted as reliable.

My experience of milk fever cases, especially if treated with chloral hydrate or potassium iodide, leads me to attribute death in the majority of cases to syncope. I wondered how often the caffeine injections have been used in the cases treated in this country. Caffeine increases respiration and pulse rate, and antagonises heart and lung inability and paresis, and is just the drug to counteract the natural and acquired (through chloral or pot. iod.) tendency to heart failure in milk fever.

I generally find the character of the pulse is by far the best guide to prognosis. We may pooh! pooh! the action of drugs and assert that their ways, like the ways of woman, are uncertain, but few of us have the courage of conviction (?) to dispense with them.

The statistics published in *The Veterinary Record* up to the present gives a total of 34 cures out of 44 cases treated and I do not think this shows so much variance with Continental statistics, and certainly does not warrant us in singing a requiem over Schmidt's treatment yet.—Yours sincerely,

G. MAYALL.

ASSISTANTS AND LOCUMS.

Sir,

It appears to me this subject of assistants and locums should be thoroughly gone into, for I do consider that much as principals may think to the contrary, veterinary assistants have a just cause for complaint.

Although never obliged to earn my living as an assistant, in my opinion the man who has simply as assistantship to look forward to after obtaining his diploma in very much to be pitied, and I for one sympathise with him, and to go a trifle further, question very much whether he will be able to pay his way at the salary some veterinary surgeons have had the kindness to offer him.

As far as my experience goes veterinary assistants are like painters, they are wanted in the spring, locum work comes in the autumn, and they may starve during the winter.

It always seems to me the salary paid to assistants is totally inadequate. Take this case for instance: Mr.

So-and-So, veterinary surgeon, has lately married and requires an assistant capable of taking sole management and to do the night work, becanse his wife does not like his leaving her of a night to calve cows and foal mares. If this man requires an assistant to perform these duties he ought at least to pay him two guineas a week indoors, or if more desirable under the circumstances three guineas outdoors and 5s. for every night case. It is nothing less than sweating a professional brother to ask him to do this work for a smaller salary, and if a man cannot afford to pay as much by all means "Let him do it himself." It is unreasonable to expect a luxury without paying for it; at least, that was my way of looking at this matter.

As regards locums work my earnings were from £1 10s. a week upwards indoors and railway fare; this, although not very profitable, was very enjoyable, but the life of many assistants must be dreadful; really I don't wonder veterinary surgeons grumble about them. "Whatever do they expect at the miserable pitance they offer? A man is better playing for nothing than working for nothing."

I sign my name as usual and trust that the outcome of this discussion will be a better salary for many a deserving and professional brother, who has simply an assistantship open to him as the means of a livelihood.—Faithfully yours,

GEO. UPTON.

Sir,

I think the locum who was punctual at meal times ought to make a good man if punctuality is the soul of business.

The impossibility of fitting a square peg into a round hole is self evident. The incongruity existing say between a highly educated assistant with a poetic soul and a principal who spells the Saviour's name with a small "*g*" and eats peas with a knife is also self-evident. The union and contact in a case like this will not last long before it is terminated.

The practice of courtesy for five minutes is easy, even if the character of the man we are brought into contact with does not excite our envy. Habitual courtesy is not easy to practice when one "lives in" with one whose expletives are neither original nor select, and whose nips are frequent and free. The practice of such courtesy, combined with the duties of an assistant is worth more than £5 a week. The question of £ s. d. is not all that ought to be considered. Compatibility of temper and a certain amount of affinity of thought are necessary for mutual ease and good. "Birds of a feather flock together," and birds of a feather generally get along pretty well together. Again, a union and equality of pay would not recognise that one assistant's place at 30s. a week in a pure health giving atmosphere is worth more than another's place in the practice where one has to change one's collar twice a day and wash one's hands, ears and face every two hours in order to present a respectable appearance.

I am afraid the question of wage is only a part of the question. Put a fair dealing gentlemanly business man with some recollection that he was once a young man himself alongside a gentlemanly competent assistant who tries to do his best, and we have the elements for the attainment of "the summum bonum."—Yours sincerely,

JAFFAR.

Sir,

Your article opened up the way for the veterinary assistant to bring his position before the profession generally, and already a number of letters both for and against him have appeared in your journal. Now there has been, and still is, a great cry about the standard of the preliminary examination being raised in order to get better educated men into the profession, the professional examinations are constantly being made stiffer, the fees raised, in short everything possible done to make it more difficult and expensive to gain the coveted M.R.C.V.S., and having gained it, in what position do those who become assistants find themselves?

In my mind the assistant has three great grievances, viz.:

1st. The amount of remuneration he receives toget her with the manner he is treated by his employers.

2nd. The unqualified assistant.

3rd. The final year's student and pupil.

To deal with the first the average salary of "veterinary-assistant" is £2 a week; that some get more I admit, but many get less. His duties are cosmopolitan, mind I don't complain that he should have to work, but I do say that his employers do not treat him as a brother professional, but rather place him on a level with any of the other servants they may employ. I can endorse the statements *re* the manner employers contradict the assistants' treatment of cases, if it does not coincide with their own particular pharmacopœia, which in many cases is antediluvian. Now if etiquette is to apply between one veterinary practitioner and another, so then should it exist between employer and assistant. I maintain also that a qualified assistant ought to receive not less than £3 per week, and the employers can afford to pay it. The niggardly manner in which assistants are paid, would in the tailoring trade, for instance, be called sweating. In reply to the several practitioners who have written *re* incompetent, drunken, tactless, etc., assistants, I would say that if you pay "screw" price you can hardly expect a sound horse.

Now then as to the unqualified assistant, final student, pupil, etc There is a great desire among our great and wise Council to simulate the medical profession; why then do they not put down their foot on the unqualified assistant, and strike off the rolls any veterinary surgeon employing such an one; he takes often a groom's wages, and in many instances is willing to do a groom's work. Let him be employed as groom, book-keeper, dispenser, or what you will, but let the Council say with no uncertain voice that he shall in no way visit, or treat cases for his employer's pecuniary benefit. Beyond the injustice to the qualified assistant, the employment of such men as veterinary assistants is quackery in its worst form. Again whilst admitting it is very necessary and beneficial for the final year's man, and pupil to see all the practice possible, I do object to a veterinary surgeon carrying on his practice with their assistance. The final year's man goes for his keep, often not even that, whilst the pupil pays the practitioner to take him; yet these gentlemen visit cases and such visits are booked in the ledger. I don't demur at their visiting their principal's cases twenty times a day, but I do object to their visits going to swell the practitioner's income. Let the Council take these matters up, put a stop to these injustices to the qualified assistant, then we will believe them honest in their alleged endeavours to protect the best interests of the profession, but at present rather do we view their efforts in the same light as we should those of the jerry builder who gives you a house with a beautiful frontage, but wretched internal accommodation.

Finally, I would say to my fellow assistants, Put not your trust in Councils, but let us unite and form an "Assistants Protection Society," as suggested by M.R.C.V.S. As a body we can assert, and enforce our legitimate rights, as individuals we are powerless.

I would like to say more, one thing especially would I like to attack, viz., the "assistant bond" but I fear I have trespassed too much already. I would be pleased to enter into correspondence with any fellow assistants to endeavour to form such a society.—Faithfully yours,

HACK.

THE FITZWYGRAM PRIZE.

Sir,

Is it true that there has been no FitzWygram Competion this year for recently qualified graduates such as was customary in previous years, for, I think, more than twenty? If this is the case can you or any of your readers inform me and the rest of the profession why this competition has ceased to exist.—I am, etc.,

PERPLEXED.

[We do not know. The prize is entirely dependent upon private benevolence, and a donor of twenty years cannot well be questioned.—ED.]

COMMUNICATIONS, BOOKS, AND PAPERS RECEIVED:—Lieut. C. B. M. Harris, Mr. G. Upton. "Jafar."

American Veterinary Review, The Agricultural Jrnl. (Cape), *Natural and Artificial Methods of Ventilation, Cape Times.*

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